

1.3 - Instrument and Valve Summary

Type	Tag	Tag	Loc	Service	Range or Set point	Manufacturer	Model or Part #	Signal Out	Maximum Pressure
Analyzing elements									
AE	311	Ar	G2	Oxygen Analyzer	0 - 100 ppm	Delta F	DF-150	0 - 10 VDC	20 psig
AE	52	HAr	E7	Filter regeneration moisture monitoring (close to exhaust)	-80 to + 20 C	Vaisala	DMT242A	4-20 mA	290 psig
AE	151	HAr	D4	Filter regeneration moisture monitoring (close to filter)	-60 to + 60 C	Vaisala	DMT242B	4-20 mA	290 psig
AE	350	Ar	***	Oxygen Analyzer	0 - 20 ppm	Delta F	DF-560	4-20 mA	20 psig
AE	322	Ar	***	Nitrogen Arc Cell	0 - 100 PPM	FNAL	-----	0 - 10 VDC	~ atm
Check valves									
CV	90	N	F8	LN2 dewar fill line check valve	no spring	Check-All Valve	UN-3-150-SS	-----	3000 psig
CV	150	Ar	F4	LArc vent line	1 psid	Circle Seal	249B-8PP	-----	3000 psig
CV	100	N	F6	LN2 dewar liquid use line	no spring	Fermilab	1/2" cryogenic check valve	-----	>> 100 psig
CV	257	Ar	D2	"Air lock" vent line backflow prevention	.3 psid	Nupro	SS-4CA-VCR	-----	3000 psig
CV	266	N2	B5	Insulating vacuum bleed up check valve	0.8 psid	Circle Seal	2598-2PP	-----	3000 psig
CV	309	HAr	D5	O2 filter regeneration check valve	< 1 psid	Parker - Veriflo Division	36FW-442VMVM-V	-----	3000 psig
CV	415	HAr	E7	Regeneration gas ventile back flow prevention	1/3 psid	Parker	4Z(A)-C4L 1/3-SS	-----	6000 psig
Pump out ports									
CVI	138	V	B3	Luke insulating vacuum pumpout and relief	~ 1 atm (spring removed)	CVI	V-1046-31	-----	~ atm
CVI	187	V	C7	Molecular sieve pbar dewar insulating vacuum pumpout/relief	+20 psig	CVI	V-1046-31	-----	~ atm
CVI	207	V	B8	Liquid argon source manifold insulating vacuum pumpout and relief	+20 psig	CVI	V-1046-31	-----	~ atm
CVI	220	V	C7	Pbar molecular sieve dewar inner vessel pumpout/relief	~ 1 atm (spring removed)	CVI	V-1046-31	-----	~ atm
CVI	259	V	D1	Luke LN2-LAr condenser insulating vacuum pumpout/relief	+20 psig	CVI	V-1046-31	-----	~ atm
CVI	260	V	D2	LN2 transfer line vacuum pumpout/relief near Luke	+20 psig	CVI	V-1046-31	-----	~ atm
CVI	285	V	E6	LN2 transfer line vacuum pumpout/relief dewar side	+20 psig	CVI	V-1046-31	-----	~ atm
CVI	286	V	E6	LN2 transfer line vacuum pumpout/PAB side	+20 psig	CVI	V-1046-31	-----	~ atm
CVI	289	V	B4	O2 filter pbar dewar insulating vacuum pumpout/relief	+20 psig	CVI	V-1046-31	-----	~ atm
CVI	382	V	A6	Bo insulating vacuum pumpout and relief	~ 1 atm (spring removed)	CVI	V-1046-31	-----	~ atm
Differential pressure transmitters									
DPT	67	Ar	C3	Luke Vapor Pump filter liquid level	0 - 5 psid	Setra	C239	4-20 mA	75 psig
DPT	100	N	G7	Liquid Nitrogen Dewar	0 - 80" wc	Barton	ITI3	4-20 mA	500 psig
Pneumatic valves									
EP	78	Ar	C2	Luke vapor pump equalization valve	Normally Closed - 100 psig actuation pressure	Swagelok	SS-6UW-V19-TF-6C	-----	2500 psig
EP	155	V	C5	Oxygen filter vacuum isolation	normally closed	VAT	F29615-17	-----	~ atm
EP	205	Ar	C1	Luke Ar vent	Normally Closed - 100 psig actuation pressure	Swagelok	SS-6UW-V19-TF-6C	-----	2500 psig
EP	222	V	C5	Molecular sieve insulating vacuum isolation	normally closed	MDC	KAV-150-P	-----	~ atm
EP	236	V	A4	Cryostat pump cart inter-stage isolation (turbo protection)	normally closed	Varian	VP1251205060	-----	~ atm
EP	308	Ar	B2	Luke vapor pump liquid inlet	10 psig to close, vacuum to fully open	Fermilab	H2 target cold valve - print # 2726.4-MB-58267	-----	45 psig
EP	347	V	A3	Seal monitor pump cart anti-suck back valve	normally closed	Norcal	3870-01455	-----	~ atm
EP	362	V	C5	LArc transfer line insulating vacuum isolation	normally closed	Temascal	45130	-----	~ atm
EP	383	V	A5	Bo vacuum pump cart turbo protection valve	normally closed	VAT	108-UE44-0006/0175	-----	~ atm
Electric valves									
EV	79	Air	C2	EP-78-Ar actuation	normally closed	Asco	8320G132 (24 VDC)	24 VDC	200 psig
EV	105	N2	D2	LN2 transfer line into Luke condenser	normally closed	Asco	8263G209LT (120 VAC)	120 VAC	100 psig
EV	106	N2	E5	LN2 transfer line vent	normally closed	Asco	8263G209LT (120 VAC)	120 VAC	100 psig
EV	223	Air	C5	EP-222-V actuation	normally closed	Humphrey	31039 RC	120 VAC	125 psig
EV	232	Air	C6	EP-155-V actuation	normally closed	Huba	???	120 VAC	> 100 psig
EV	233	Air	C6	EP-362-V actuation	normally closed	Humphrey	T125 4E136	120 VAC	125 psig
EV	258	Air	D2	Material basket catch/release mechanism actuation	normally closed	Humphrey	062-4E1-36	120 VAC	125 psig
EV	270	N2	D1	EP-205-Ar actuation	normally closed	Asco	8320G132 (24 VDC)	24 VDC	200 psig
EV	287	V	A4	EP-236-V actuation	normally open	Peter Paul Electronics	51X00111CD	120 VAC	~ atm
EV	346	AIR	A3	Seal monitor pump cart anti-suck back valve actuation	normally closed	ARD Fluid Power	A2155-120-A-G	120 VAC	100 psig
EV	384	V	B5	EP-383-V actuation	normally closed	MAC	N-7557-019	120 VAC	100 psig
Filters									
F	395	Ar	F3	Removal of O2, H2O, and HC's from Luke contamination gas	-----	Airgas	Y40-RES0010K	-----	160 psig

Flowmeters

FI 278	Ar	F2	Luke vapor pump trapped volume relief (PSV-156-Ar)	0 - 50 sccm	Dwyer	RMA-151-SSV	-----	100 psig
FI 279	Ar	F2	Luke vapor pump electronic purge	0 - 50 sccm	Dwyer	RMA-151-SSV	-----	100 psig
FI 280	Ar	F1	Luke ASME relief purge (PSV-210-Ar)	0 - 50 sccm	Dwyer	RMA-151-SSV	-----	100 psig
FI 281	Ar	F1	Molecular sieve trapped volume relief purge (PSV-219-Ar)	0 - 50 sccm	Dwyer	RMA-151-SSV	-----	100 psig
FI 282	Ar	F1	O2 filter inlet side trapped volume relief (PSV-249-Ar)	0 - 50 sccm	Dwyer	RMA-151-SSV	-----	100 psig
FI 283	Ar	F1	O2 filter outlet side trapped volume relief (PSV-250-Ar)	0 - 50 sccm	Dwyer	RMA-151-SSV	-----	100 psig
FI 284	Ar	F1	Material lock release mechanism argon purge	0 - 50 sccm	Dwyer	RMA-151-SSV	-----	100 psig
FI 305	Ar		Material lock relief valve purge	0 - 50 sccm	Dwyer	RMA-151-SSV	-----	100 psig
FI 306	Ar		Material lock window o-ring purge	0 - 50 sccm	Dwyer	RMA-151-SSV	-----	100 psig
FI 312	Ar	G2	Oxygen monitor inlet flowrate	0 - 5 SCFH SP is 2 SCFH N2 equiv	Dwyer	VFA-3	-----	150 psig
FI 315	Ar	F1	ArI lock argon purge flowmeter	0 - 10 SCFH	Dwyer	RMB-50-SSV	-----	100 psig
FI 390	Ar	E2	Bo ASME relief purge (PSV-378-Ar)	0 - 50 sccm	Dwyer	RMA-151-SSV	-----	100 psig
FI 391	Ar	E2	Not in use	0 - 50 sccm	Dwyer	RMA-151-SSV	-----	100 psig
FI 392	Ar	E2	Not in use	0 - 50 sccm	Dwyer	RMA-151-SSV	-----	100 psig
FI 406	HAr	D6	Oxygen filter regeneration gas flow rate (metering valve limits to 5 SCFH)	0 - 50 SCFH	Dwyer	RMB-52-SSV	-----	100 psig

Flow restricting orifices

FO 212	Ar	C7	Liquid argon source manifold argon flow restriction	0.122" dia.	Fermilab	-----	-----	-----
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Heating elements

HTR 8	HAr	B4	Oxygen filter regeneration heater	1000W / 240 VAC	Omega	heating tape compressed by a clamshell	-----	-----
HTR 21	Ar	B1	Luke vapor pressure building heater	250 W / 120 VAC	Watlow	Firerod	-----	-----
HTR 22	Ar	A6	Bo vapor pressure building heater	250 W / 120 VAC	Watlow	Firerod	-----	-----
HTR 55	HAr	B4	Oxygen filter gas pre-heater	150 W / 120 VAC	Watlow	Firerod	-----	-----
HTR 72	HAr	C1	Luke vapor pump filter regeneration heater	1500 W / 120 VAC	Watlow	Firerod	-----	-----
HTR 75	Ar	C1	Luke vapor pump cup heater	250 W / 120 VAC	Watlow	Firerod	-----	-----
HTR 215	Ar	C7	Molecular sieve regeneration heater	1000W / 240 VAC	Omega	heating tape compressed by a clamshell p/n STH-052-120	-----	-----
HTR 500	HAr		Luke external filter heater	1000W / 240 VAC	Omega	heating tape compressed by a clamshell p/n STH-052-120	-----	-----

Output to DAQ

INTL 325	Ar	*	24 VDC output to purity monitor for liquid level interlock	-----	-----	-----	-----	-----
INTL 307	Ar	*	Input to PLC that indicates when purity monitor is taking data	-----	-----	-----	-----	-----

Liquid level transmitters

LT 10	N2	D1	Luke condenser LN2 level	0-20.5 inches	American Magnetics	Model 286 Controller	4-20 mA	> 35 psig
LT 13	Ar	C3	Luke cryostat LAr level	0-39.62 inches	American Magnetics	Model 286 Controller	4-20 mA	> 35 psig
LT 372	Ar	B7	Bo cryostat LAr level	0-39.62 inches	American Magnetics	Model 286 Controller	4-20 mA	> 35 psig

Manual valves

MV 80	N	G6	LN2 dewar pressure gauge isolation	-----	Swagelok	SS-4BK-VCO	-----	1000 psig
MV 85	N	F6	LN2 dewar vapor line pressure sensing isolation	-----	Anderson Greenwood	MM1VS 2-8174-3	-----	6000 psig
MV 86	N	F7	LN2 dewar level gauge equalization	-----	Anderson Greenwood	MM1VS 2-8174-3	-----	6000 psig
MV 87	N	F7	LN2 dewar liquid line pressure sensing isolation	-----	Anderson Greenwood	MM1VS 2-8174-3	-----	6000 psig
MV 88	N	G8	LN2 dewar pressure building regulator isolation	-----	Nibco	???	-----	600 psig
MV 89	N	H6	LN2 dewar pressure building loop isolation	-----	Nibco	???	-----	600 psig
MV 90	V	F8	LN2 dewar vacuum pump out	-----	Vaca	FO-100	-----	~ atm
MV 90	N	H7	LN2 dewar vacuum pump out	-----	Nibco	???	-----	600 psig
MV 91	V	F7	LN2 dewar vacuum readout isolation	-----	Nupro	SS-4BK-VCO	-----	1000 psig
MV 91	N	E7	LN2 dewar fill line drain valve	-----	Worcester	1/2 C4416P	-----	870 psig
MV 92	N	F7	LN2 dewar fill line isolation	-----	Worcester	1 1/2 C4416P	-----	870 psig
MV 93	N	H7	LN2 dewar vapor vent	-----	Nibco	???	-----	600 psig
MV 94	N	G8	LN2 dewar full trycock	-----	Nibco	???	-----	600 psig
MV 95	N	F6	LN2 dewar pressure building loop bypass	-----	Nibco	???	-----	600 psig
MV 96	N	F6	LN2 dewar pressure building regulator isolation	-----	Nibco	???	-----	600 psig
MV 97	N	F6	LN2 dewar liquid withdrawal	-----	Cryolab	ES7-86-2TPC2	-----	???
MV 98	N	H7	LN2 dewar relief valve selector	-----	Anderson Greenwood	SVS-0600T-BSTC	-----	1200 psig
MV 99	N	H7	LN2 dewar vapor vent valve	-----	Anderson Greenwood	H5VB 22	-----	> 75 psig
MV 100	N	F6	LN2 dewar liquid into PAB isolation	-----	Cryolab	CV8-086-5WPY?2-ED	-----	150 psig
MV 101	N	H7	LN2 dewar vapor vent valve	-----	Anderson Greenwood	H5VB 22	-----	> 75 psig
MV 107	N	F6	LN2 dewar isolation for future gas use	-----	Nibco	???	-----	600 psig
MV 119	N	F6	LN2 liquid transfer line branch isolation	-----	Cryolab	CV8-086-SWTG2	-----	100 psig
MV 120	N	E6	LN2 liquid transfer line Luke/Bo branch isolation	-----	Cryolab	CV8-086-SWPG2	-----	150 psig
MV 124	Ar	E3	Ar with O2 contamination source bottle regulator outlet isolation	-----	Scientific Gas Products	5939	-----	3000 psig
MV 127	Ar	E3	Ar with O2 contamination source line regulator outlet isolation	-----	Nupro	B-4HK2	-----	1000 psig
MV 128	Ar	E3	Gas contamination introduction isolation	-----	Swagelok	SS-4BK-TW	-----	1000 psig
MV 131	N2	F3	No contamination source regulator outlet isolation	-----	Swagelok	SS-4BK-TW	-----	1000 psig
MV 132	N2	G3	Contamination manifold vacuum isolation	-----	Swagelok	SS-4BK-VCO	-----	1000 psig
MV 202	Ar	C4	Filter assembly inlet isolation	-----	Swagelok	SS-4BG-V51	-----	1000 psig
MV 204	Ar	B8	Liquid argon source manifold argon line isolation/pumpout	-----	Swagelok	SS-8BG-V47	-----	1000 psig
MV 208	Ar	C4	Filter assembly outlet isolation	-----	Swagelok	SS-4BG-V51	-----	1000 psig
MV 213	Ar	C7	Liquid argon source manifold isolation	-----	Swagelok	SS-8BG-V47	-----	1000 psig
MV 217	Ar	C7	Molecular sieve isolation	-----	Swagelok	SS-8BG-V47	-----	1000 psig

MV	218	Ar	C7	Molecular sieve isolation/pumpout	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	224	V	A5	Transfer line insulating vacuum pump cart roughing pump port isolation	----	Leybold	281 53B1	-----	~ atm
MV	227	V	A5	Insulating vacuum pump cart port isolation	----	MKS	22406	-----	~ atm
MV	228	V	A5	Insulating vacuum pump cart port isolation	----	Leybold	281 53B1	-----	~ atm
MV	229	V	A4	Cryostat pump cart port isolation	----	Unknown model	Unknown brand	-----	~ atm
MV	237	V	A3	Seal monitor pump cart isolation	----	Norcal	3879-01455	-----	~ atm
MV	239	Ar	B8	Liquid argon bypass for both Luke and Bo	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	241	Ar	C3	Gas contamination introduction isolation	----	Parker/Veriflo	930 series	-----	250 psig
MV	242	Ar	C3	Gas contamination introduction isolation	----	Swagelok	6LV-DLBW4	-----	3500 psig
MV	244	Ar	C3	Luke cryo isolation valve	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	246	Ar	D3	Gas contamination introduction isolation	----	Swagelok	6LV-DLBW4	-----	3500 psig
MV	247	Ar	C3	Luke vapor pump filter regeneration gas outlet isolation	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	248	Ar	C2	Luke vapor pump filter regeneration gas inlet isolation	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	251	V	C2	"Air lock" vacuum isolation	----	MDC	AV-150	-----	~ atm
MV	252	Ar	C2	"Air lock" argon bottle purge isolation	----	Swagelok	SS-4BG-V51	-----	1000 psig
MV	253	Ar	C2	"Air lock" cryostat vapor purge isolation	----	Swagelok	SS-4BG-V51	-----	1000 psig
MV	254	V	C2	Luke materials test station air lock pass thru	----	Norcal	GVM-6002-CF	-----	> 35 psig
MV	255	Ar	C1	Luke manual vapor vent	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	256	Ar	C2	"Air lock" purge vent isolation	----	Swagelok	SS-4BG-V51	-----	1000 psig
MV	261	V	B1	Luke insulating vacuum isolation/pumpout	----	Swagelok	SS-4BG-V51	-----	1000 psig
MV	265	N2	B5	Bleed up cylinder regulator outlet isolation	----	Parker	???	-----	~ 1000 psig
MV	267	V	C5	Transfer line insulating vacuum nitrogen bleed up isolation	----	Swagelok	SS-4BK-VCO	-----	1000 psig
MV	268	Air	E1	Shop air isolation	----	Worcester	1/2" 416N SE	-----	250 psig
MV	277	Ar	F2	Argon purge regulator outlet isolation	----	Legris	Appears to be a 4812 10.17	-----	2030 psig
MV	290	Ar	C2	Air lock purge inlet isolation	----	Swagelok	SS-4BG-V51	-----	1000 psig
MV	291	Ar	D2	Air lock purge oxygen monitor isolation	----	Swagelok	SS-4BG-V51	-----	1000 psig
MV	294	Ar	G1	Oxygen monitor manifold inlet isolation	----	Swagelok	SS-4BG-V51	-----	1000 psig
MV	295	V	G1	Oxygen monitor vacuum pump isolation	----	Swagelok	SS-4BG-V51	-----	1000 psig
MV	296	Ar	F1	Oxygen monitor open port isolation	----	Swagelok	SS-4BG-V51	-----	1000 psig
MV	300	Ar	G2	Oxygen monitor metering valve	----	Swagelok	SS-4MG-XX	-----	700 psig
MV	304	N2	E2	LN2 condenser back pressure regulator bypass	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	310	Ar	G2	Oxygen monitor inlet isolation	----	Nupro	SS-DLXX	-----	3500 psig
MV	316	Ar	F2	Argon purge flowmeter manifold inlet isolation	----	Unknown Brand	Unknown Model	-----	~ 1000 psig
MV	317	Ar	A6	Bo double o-ring vacuum	----	Swagelok	SS-4BG-V51	-----	1000 psig
MV	318	Ar	C3	Luke vapor space tap (for external gas circulation)	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	319	Ar	C3	Luke vapor space tap	----	Carten	MD250-05-LV	-----	375 psig
MV	327	Ar	D1	Luke condenser argon space vent	----	Swagelok	SS-4BG-V51	-----	1000 psig
MV	328	Ar	C2	Luke vapor pump equalization isolation	----	Swagelok	SS-8BG-TW	-----	1000 psig
MV	329	Ar	C2	Luke vapor pump vent isolation	----	Swagelok	SS-8BG-TW	-----	1000 psig
MV	333	CO2	D2	Vapor pump transport CO2 bottle regulator outlet isolation	----	Parker	4PM-PR4-VT-B	-----	3000 psig
MV	336	V	C3	Vapor pump cold valve vacuum isolation	----	Swagelok	SS-4BK-TW	-----	1000 psig
MV	337	He	C3	Vapor pump cold valve isolation at vapor pump top flange	----	Nupro	SS-4P4T4	-----	3000 psig
MV	338	He	C3	Vapor pump cold valve He supply isolation	----	Nupro	SS-4BK-VCO	-----	1000 psig
MV	342	He	D4	He bottle regulator outlet isolation	----	Unknown Brand	Unknown Model	-----	~ 3000 psig
MV	349	Ar	C4	Luke vapor space tap (for external gas circulation)	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	354	Ar	C3	Luke liquid space tap isolation	----	Swagelok	SS-4BG-V51	-----	1000 psig
MV	360	V	B3	Luke vacuum pumpout isolation valve	----	MDC	AV-250	-----	~ atm
MV	365	V	C5	O2 filter vacuum isolation (downstream tap)	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	366	V	C5	O2 filter vacuum isolation (upstream tap)	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	368	V	A7	Bo insulating vacuum isolation	----	Swagelok	SS-4BG-V51	-----	1000 psig
MV	369	V	A7	Bo insulating vacuum isolation/pumpout	----	Balzers	EVA 016H	-----	~ atm
MV	370	Ar	C3	Luke drain valve	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	375	N2	D5	PT-27-N2 isolation	----	Parker	4F-PR4-VT-B	-----	3000 psig
MV	379	Ar	B6	Bo LAr fill isolation valve	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	380	Ar	B6	Bo venting isolation	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	381	V	B6	Bo inner vessel vacuum pumpout	----	MDC	AV250	-----	~ atm
MV	386	V	A5	Bo vacuum pump cart rough pump isolation	----	Leybold	2870282	-----	~ atm
MV	387	V	B5	Bo vacuum pump cart bleed up valve	----	Rial	Unknown Model	-----	~ atm
MV	393	Ar	F2	Luke contamination gas filter isolation	----	Carten	MD250-05-LV	-----	375 psig
MV	394	Ar	F3	Luke contamination gas filter isolation	----	Carten	MD250-05-LV	-----	375 psig
MV	401	HAr	E8	5% H2 95% Ar O2 filter regeneration gas metering valve	----	Swagelok	SS-SS4-VH	-----	2000 psig
MV	418	HAr	E7	Regeneration vacuum pump isolation	----	Whitey	B-42S4	-----	2500 psig
MV	419	HAr	E7	Regeneration vacuum pump isolation	----	Whitey	B-42S4	-----	2500 psig
MV	420	HAr	E7	Regeneration vacuum pump bleed up	----	Nupro	B-4JN	-----	600 psig
MV	461	HAr	C4	One pass fill filter regeneration isolation	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	480	HAr	C5	One pass fill filter regeneration isolation	----	Swagelok	SS-8BG-V47	-----	1000 psig
MV	V2	Air	D8	Regulator isolation	----	Swagelok	SS-4P4T4	-----	3000 psig
MV	V4	Air	D8	Regulator isolation	----	Swagelok	SS-4P4T4	-----	3000 psig
MV	V7	Ar	D7	Line pressure regulator outlet isolation	----	Concoa	Unknown Model	-----	~ 1000 psig
MV	V8	HAr	E7	Regeneration vacuum pump isolation	----	Swagelock	B-4HK	-----	1000 psig
MV	V9	HAr	D6	Bench top oxygen filter regeneration isolation	----	Swagelok	SS-4P4T4	-----	3000 psig
MV	V10	HAr	D7	Regeneration gas isolation	----	Swagelok	SS-4P4T4	-----	3000 psig
MV	V12	HAr	D7	Regeneration gas isolation	----	Swagelok	SS-4P4T4	-----	3000 psig
MV	V14	HAr	E8	5% H2 95% Ar O2 filter regeneration gas bottle regulator outlet isolation	----	Matheson	LMF4373	-----	3500 psig

MV	V17	HAR	E7	Regenerator gas isolation	----	Swagelok	SS-4P4T4	----	3000 psig
Pressure regulators and pressure control valves									
PCV	70	N	F8	Fill shut off valve (Sensitive to vibration)	75 psig (MAWP)	Messer / Chart	MG-97 P	----	600 psig
PCV	121	Ar	E3	Ar with O2 contamination source bottle regulator	30 psig	Scientific Gas Products	R35D 350	----	3000 psig
PCV	125	Ar	E3	Ar with O2 contamination source line regulator	10 psig (25 psig max outlet)	Air Products	E11-B-N141A	----	400 psig
PCV	129	N2	F3	Nitrogen contamination source bottle regulator	30 psig	Parker / Veriflo	735 series	----	3500 psig
PCV	262	N2	B5	LAr transfer line insulating vacuum bleed up regulator	10 psig	Victor	VTS 450B	----	3000 psig
PCV	269	Air	E1	Shop air point of use regulator	100 psig (0-125 psig range)	Norgren	B12-496-M31-A	----	250 psig
PCV	273	Ar	F2	Argon purge bottle regulator	15 psig	Victor	VTS 450B	----	3000 psig
PCV	292	Air	D2	Materials basket catch/release mechanism line pressure regulation	40 psig	Humphrey	062-4E1-36	----	125 psig
PCV	297	Air	G1	Oxygen monitor inlet pressure regulation	5 psig	Matheson	9463-4-V4FM	----	3000 psig
PCV	330	CO2	D3	Vapor pump transport CO2 bottle regulator	30 psig	IMI Cornelius Inc	857-A Style PL-160	----	2400 psig
PCV	339	He	D4	Vapor pump cold valve He supply bottle regulator	30 psig	Victor	VTS 450B	----	3000 psig
PCV	388	N2	E2	Luke condenser back pressure regulator	30 psig	Cash Acme	123-5 1 in. x 1 in.	----	100 psig
PCV	396	HAR	E8	O2 filter regeneration gas bottle regulator (located outside PAB)	20 psig	Airco	400 Series	----	4000 psig
PCV	402	Ar	D7	Line pressure regulation	Not in use	Concoa	400 Series	----	4000 psig
Vacuum pressure elements									
PE	91	V	F7	LN2 dewar insulating vacuum	10 ⁻⁴ 1000 Torr	Hastings	gauge tube	----	~ atm
PE	225	V	B8	Liquid argon source manifold insulating vacuum	10 ⁻⁴ 1000 Torr	Granville-Phillips	275 series gauge tube	----	~ atm
PE	226	V	A5	Insulating vacuum pump cart inter stage pressure	10 ⁻⁴ 1000 Torr	Granville-Phillips	275 series gauge tube	----	~ atm
PE	230	V	A5	Insulating vacuum pump cart pressure	10 ⁻⁴ 1000 Torr	Granville-Phillips	275 series gauge tube	----	~ atm
PE	231	V	A5	Insulating vacuum pump cart pressure	10 ⁻⁴ 1000 Torr	Granville-Phillips	275 series gauge tube	----	~ atm
PE	234	V	C5	Transfer line insulating vacuum pressure	10 ⁻⁴ 1000 Torr	Granville-Phillips	275 series gauge tube	----	~ atm
PE	235	V	C4	Oxygen filter insulating vacuum	10 ⁻⁴ 1000 Torr	Granville-Phillips	275 series gauge tube	----	~ atm
PE	239	V	A2	Seal monitor pump cart pressure	10 ⁻⁴ 1000 Torr	Granville-Phillips	275 series gauge tube	----	~ atm
PE	288	V	A4	Cryostat pump cart vacuum pressure	10 ⁻⁴ 1000 Torr	Hastings	gauge tube	----	~ atm
PE	312	V	G1	Oxygen monitor manifold vacuum pump inlet pressure	10 ⁻⁴ 1000 Torr	Granville-Phillips	275 series gauge tube	----	~ atm
PE	348	V	D2	LN2 transfer insulating vacuum near Luke	10 ⁻⁴ 1000 Torr	Hastings	gauge tube	----	~ atm
PE	371	V	A7	Bo insulating vacuum gauge tube	10 ⁻⁴ 1000 Torr	Granville-Phillips	275 series gauge tube	----	~ atm
PE	408	V	E6	LN2 transfer insulating vacuum dewar side	10 ⁻⁴ 1000 Torr	Hastings	gauge tube	----	~ atm
PE	409	V	E6	LN2 transfer insulating vacuum highbay side	10 ⁻⁴ 1000 Torr	Hastings	gauge tube	----	~ atm
PE	416	HAR	E7	Regeneration gas vent line pressure	10 ⁻⁴ 1000 Torr	Granville-Phillips	275 series gauge tube	----	~ atm
PE	417	HAR	E7	Regeneration gas vacuum pump inlet pressure	10 ⁻⁴ 1000 Torr	Granville-Phillips	275 series gauge tube	----	~ atm
Pressure indicating gauges									
PI	12	Ar	C1	Luke cryostat Ar pressure	30-0-60 psig	AMETEK	1535-V-0-60-PSI/KPA-CBM-FVCR-FR	----	60 psig
PI	44	N2	D5	LN2 transfer line pressure	0 - 150 psig	US Gauge	Unknown model	----	150 psig
PI	100	N	G6	LN2 dewar pressure	0 - 100 psig	US Gauge	150025X	----	100 psig
PI	122	Ar	F3	Ar with O2 contamination source bottle pressure	0 - 3000 psig	Scientific Gas Products	Unknown model	----	3000 psig
PI	123	Ar	F3	Ar with O2 contamination source regulated bottle pressure	30 - 0 - 30 psig	US Gauge	Unknown model	----	30 psig
PI	126	Ar	F3	Ar with O2 contamination source regulated line pressure	30 - 0 - 30 psig	Unknown brand	Unknown model	----	30 psig
PI	130	N2	G3	N2 contamination source bottle pressure	0 - 3000 psig	Wika	Unknown model	----	3000 psig
PI	133	N2	D1	LN2 vent back pressure	30 - 0 - 150 psig	US gauge	Unknown model	----	30 psig
PI	134	N2	G3	N2 contamination regulated pressure	0 - 60 psig	Wika	Unknown model	----	60 psig
PI	243	Ar	C3	Gas contamination sample bottle isolation	30-0-150 psig	AMETEK	160552	----	150 psig
PI	263	N2	B5	Bleed up cylinder bottle pressure	0 - 4000 psig	US Gauge	BU-2581-AQ	----	4000 psig
PI	264	N2	B5	Bleed up cylinder regulated pressure	0 - 60 psig	US Gauge	CU-2581-HY	----	60 psig
PI	272	Air	E1	Shop air regulated pressure	0 - 160 psig	Unknown brand	Unknown model	----	160 psig
PI	274	Ar	F2	Argon purge cylinder pressure	0 - 4000 psig	US Gauge	BU-2581-AQ	----	4000 psig
PI	275	Ar	F2	Argon purge cylinder regulated pressure	0 - 60 psig	US Gauge	CU-2581-HY	----	60 psig
PI	293	Ar	D2	Materials basket catch/release mechanism line pressure regulator outlet	0 - 200 psig	???	???	----	200 psig
PI	298	Ar	G1	Oxygen monitor line pressure regulator inlet pressure	0 - 3000 psig	Matheson	63 - 2233V	----	3000 psig
PI	299	Ar	G1	Oxygen monitor line pressure regulator outlet pressure	30 - 0 - 60 psig	Matheson	63 - 2206V	----	60 psig
PI	326	Ar	C1	Material lock pressure	30 - 0 - 60 psig	US Gauge	Unknown model	----	60 psig
PI	331	CO2	D3	Vapor pump transport CO2 bottle regulator inlet pressure	0 - 2000 psig	Unknown brand	Unknown model	----	2000 psig
PI	332	CO2	D3	Vapor pump transport CO2 bottle regulator outlet pressure	0 - 200 psig	US Gauge	Unknown model	----	200 psig
PI	334	CO2	D3	Vapor pump cold valve pressure	30 - 0 - 30 psig	US Gauge	Unknown model	----	30 psig
PI	340	He	D4	He bottle regulator inlet	0 - 4000 psig	US Gauge	Unknown model	----	4000 psig
PI	341	He	D4	He bottle regulator outlet	0 - 60 psig	US Gauge	Unknown model	----	60 psig
PI	345	Ar	B7	LAr supply manifold line pressure	30 - 0 - 400 psig	Ashcroft	25-1009SWXVKLL	----	400 psig
PI	363	Ar	B7	Bo cryostat Ar pressure	30-0-60 psig	Ashcroft	25-1009SWXVKLL	----	60 psig
PI	397	HAR	E8	5% H2 95% Ar O2 filter regeneration gas bottle regulator inlet pressure	0 - 3000 psig	Marsh	Unknown model	----	3000 psig
PI	398	HAR	E8	5% H2 95% Ar O2 filter regeneration gas bottle regulator outlet pressure	0 - 30 psig	Marsh	Unknown model	----	30 psig
PI	403	Ar	D7	Line pressure	0 - 2000 psig	Wika	Unknown model	----	2000 psig
PI	404	Ar	D7	Line pressure regulator inlet pressure	0 - 4000 psig	Concoa	0550-0208	----	4000 psig
PI	405	Ar	D7	Line pressure regulator outlet pressure	30 - 0 - 100 psig	Concoa	0550-0202	----	100 psig

Relief valves

SV	90	N	F7	LN2 dewar fill line trapped volume relief	200 psig	Circle Seal	5120B-4MP-200	----	2400 psig
SV	90	V	G8	LN2 dewar vacuum jacket relief	~ 0 psig, no spring	Circle Seal	Parallel Plate - 3.5"	----	~ atm
SV	96	N	F6	LN2 dewar pressure building loop trapped volume relief	80 psig	Circle Seal	5159B-4MP-80	----	2400 psig
SV	97	N	G6	LN2 dewar pressure building loop trapped volume relief	80 psig	Circle Seal	5159B-4MP-80	----	2400 psig
SV	98	N	G6	LN2 dewar pressure building loop trapped volume relief	80 psig	Circle Seal	5159B-4MP-80	----	2400 psig
SV	99	N	H6	LN2 dewar relief valve	75 psig	Anderson Greenwood	81S12166	----	> 75 psig
SV	100	N	H7	LN2 dewar relief valve	75 psig	Anderson Greenwood	81S12166	----	> 75 psig

Temperature elements

TE	6	N2	E5	LN2 transfer line cool down temperature (control)	70-400K	Omega	Platinum RTD (PR-19-2-100-1/8-6-E)	----	~ atm ^(b)
TE	7	Ar	B4	O2 filter internal temperature (hard wired interlock)	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(b)
TE	23	Ar	B1	HTR-21-Ar internal temperature (read out)	-200 to 1300 C	Watlow	Type K thermocouple	----	~ atm ^(b)
TE	24	Ar	B1	HTR-21-Ar internal temperature (hard wired interlock)	-200 to 1300 C	Watlow	Type K thermocouple	----	~ atm ^(b)
TE	25	Ar	A6	HTR-22-Ar internal temperature (read out)	-200 to 1300 C	Watlow	Type K thermocouple	----	~ atm ^(b)
TE	26	Ar	A6	HTR-22-Ar internal temperature (hard wired interlock)	-200 to 1300 C	Watlow	Type K thermocouple	----	~ atm ^(b)
TE	54	Ar	B4	O2 filter internal temperature (read out)	70-400K	Minco	100 ohm platinum RTD (Part # S201PD)	----	~ atm ^(b)
TE	56	Ar	B4	O2 filter regeneration gas pre-heater temperature (control)	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(b)
TE	57	Ar	B4	O2 filter regeneration gas pre-heater temperature (hard wired interlock)	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(b)
TE	73	HAR	C1	Luke Vapor pump filter regeneration heater (control)	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(b)
TE	74	HAR	C1	Luke Vapor pump filter regeneration heater (hard wired interlock)	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(b)
TE	76	Ar	C1	Luke Vapor pump "cup" heater (control)	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(b)
TE	77	Ar	C1	Luke Vapor pump "cup" heater (hard wired interlock)	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(b)
TE	81	HAR	B3	Luke Vapor pump filter bed (ID)	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(b)
TE	82	HAR	B3	Luke Vapor pump filter bed (OD)	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(b)
TE	83	HAR	B2	Luke Vapor pump filter bed (middle)	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(b)
TE	214	Ar	C7	Molecular sieve regeneration temperature (hard wired interlock)	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(b)
TE	216	Ar	C7	Molecular sieve regeneration temperature (controls)	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(b)
TE	324	Ar	B1	Material lock elevator temperature probe	70-400K	Minco - cryogenic	100 ohm platinum RTD (Part # S270PD12(E))	----	35 psid ^(c)
TE	410	Air	E1	PAB high bay ambient air temperature	70-400K	Minco	100 ohm platinum RTD (Part # S201PD)	----	~ atm ^(d)
TE	411	CS	C3	Luke top flange temperature	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(e)
TE	412	CS	***	Luke top flange temperature	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(e)
TE	505	HAR		Luke external gas filter core temperature	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(e)
TE	506	HAR		Luke external gas filter OD temperature - readout	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(e)
TE	507	HAR		Luke external gas filter OD temperature - interlock	-200 to 1300 C	Omega	Type K thermocouple	----	~ atm ^(e)

* Found on EE-435364

** Currently not in use

(a) Temperature element is located in vent piping such that it cannot be significantly pressurized.

(b) Temperature element is located in a sealed stainless steel tube. The welded cap on the tube provides the pressure seal between the temperature element and the liquid argon.

(c) Temperature element is a "nude" platinum RTD mounted on the material elevator. The signal wires are soldered to a feed thru.

(d) Temperature element is mounted external to the cryogenic piping and measures the ambient room temperature.

(e) Temperature element is mounted external to the cryogenic piping and measures the temperature of Luke's top flange.